Allergic Rhinitis in Children: Impact on Sleep Quality

Subjects: Otorhinolaryngology

Contributor: Sameh Mezri

Through this study, we propose to study the impact of allergic rhinitis and its treatment on children's sleep quality. We conducted a prospective longitudinal study conducted at the ENT department of the military hospital in Tunis during the period from 2019 to 2021, including children with confirmed allergic rhinitis and aged from 4 to 16 years. The sleep assessment was judged according to Spruyt Gozal's questionnaire and Epworth's sleepiness scale. One hundred patients were included in our study with an average of 9.09 years. The main symptom was nasal obstruction and a common allergen was mites. Half of patients have excessive daytime sleepiness. The score of Spruyt Gozal showed that 60% of children have respiratory sleep disorders. An obstructif sleep apnea syndrome (OSAS) was confirmed in 40% of them. Sleep quality impairment was more pronounced in children with moderate to severe RA with a statistically significant difference ($p<0.05$) and a statistically significant link between elevated sleep quality scores and asthma and obesity. AR constitutes a significant public health concern in children, notably due to its detrimental effects on sleep quality. Given its potential repercussions on cognitive development, behavior, and quality of life, it is essential that clinicians systematically investigate sleep disturbances in all pediatric patients presenting with AR.

Allergic rhinitis | Child, Quality of life | sleep disorders | obstructif sleep apnea syndrome.

1. Introduction

Sleep is an essential physiological need, playing a pivotal role in the development and well-being of every individual. Any disruption, whether quantitative or qualitative, can have detrimental effects on health and quality of life, particularly in children who are in a period of growth. Thus, it is crucial to identify the causes of these sleep disturbances and to take action to prevent the consequences [1][2]. Allergic rhinitis (AR) is a widespread allergic condition in the pediatric population. Despite its apparent benign nature, AR is considered a debilitating disease due to its impact on children's quality of life. Recent studies focus more on this negative impact on physical and psychosocial aspects, especially sleep. In our region, despite its significance, this impact on sleep quality remains an undervalued and undertreated aspect of AR morbidity [3][4]. Through this study, we evaluated the impact of allergic rhinitis on the quality of sleep, in children before and under treatment.

2. Methods

2.1. Study Type

A prospective longitudinal descriptive study gathering children followed at the Military Hospital of Tunis for AR during the period from October 2019 to March 2021.

2.2. Study Population

Inclusion Criteria: We included patients aged 4 to 16 years who were diagnosed with allergic rhinitis for the first time at the start of the study with one or more positive allergy test(s). A minimum of two months of well conducted treatment was required.

Exclusion Criteria: Patients with chronic diseases other than comorbidities associated with rhinitis, causing nasal obstruction (juvenile nasosinusoidal polyposis, nasosinusoidal tumor, post-radiotherapy, granulomatous...) and or under treatment at risk of drowsiness (eg neuroleptics, muscle relaxants, …) and or already followed for a sleep disorder (eg narcolepsy or idiopathic hypersomnia) are excluded.

2.3. Study Procedure

Due to the Tunisian pollen season, patient recruitment was carried out in two periods: the first period between October 2019 and March 2020 and the second one between October 2020 and March 2021. For all children, we conducted clinical and paraclinical examinations to confirm or rule out the diagnosis of AR. The severity of AR was assessed according to the ARIA 2016 classification [5]. All patients received medical treatment according to the SFORL 2019 recommendations [6], while explaining hygiene rules and the importance of adherence for children and their guardians. All data were recorded on a predefined information sheet specific to each patient. To assess the impact of AR on sleep quality, children and their guardians (for younger children) completed the validated Arabic version of two questionnaires:

- The Spruyt Gozal Score: Comprising 6 questions evaluating sleep-disordered breathing in children, with a cumulative score > 2.72 considered predictive of sleep-disordered breathing: obstructive sleep apnea syndrome (OSAS), central sleep apnea (CSA), and mixed or complex sleep apnea [7].

- The Epworth Sleepiness Scale adapted for the pediatric population: Assessing daytime sleepiness in children and adolescents. A score > 9 is considered pathological [8].

After two months of treatment, we used the same questionnaires to assess the impact of the AR therapeutic arsenal on sleep quality. We defined "good therapeutic control of sleep quality" after two months of AR treatment as children having: a Spruyt Gozal cumulative score < 2.72 after treatment and an Epworth score < 10.

2.4. Statistics methods

The collected data were computerized using the statistical software program: SPSS 26. An analytical section involved a bivariate analysis to identify factors influencing sleep quality in children with allergic rhinitis. In this analysis, the dependent variable was dichotomous (influencing sleep quality or not). Thus, in the bivariate analysis,

the statistical tests used were the chi-square test or Fisher's exact test for qualitative variables and student's t-test for quantitative variables. The significance threshold was set at 0.05.

3. Results

One hundred patients aged from 4 to 16 years were included in our study with 58 boys and 42 girls. The average age of the children was 9.09 ± 3.3 years. Nasal obstruction (NO) was the primary symptom, found in all cases, with 75% of cases exhibiting a fluctuating pattern. A history of atopy, mainly asthma, was present in half of the children.

Non-allergic comorbidities were dominated by nocturnal snoring, observed in 60% of cases, with OSAS confirmed by ventilatory polygraphy in 40 cases. The prick test was positive in 80% of cases, with dust mites being the most commonly identified allergen. According to the ARIA 2016 classification, 39% of our patients had moderate to severe persistent AR. All patients received medical treatment based on the SFORL 2019 recommendations.

Sleep quality was assessed using two validated questionnaires: the Epworth Sleepiness Scale and the Spruyt-Gozal score. Sixty children experienced sleep quality disturbances due to respiratory issues, with a Spruyt-Gozal score > 2.72.

Fifty children had excessive daytime sleepiness with an Epworth score >10 (**Table 1**).

Table 1. Distribution of Children According to the Epworth Sleepiness Scale and the Spruyt Gozal Score before treatment.

		Percentage of patients (%)
Epworth Sleepiness Scale	0-9	50
	10-15	30
	>16	20
Spruyt Gozal Score	< 2.72	40
	> 2.72	60

We studied the severity of AR in children with sleep-disordered breathing, indicated by a Spruyt-Gozal score > 2.72. We observed that sleep-disordered breathing was more prevalent in children with moderate to severe AR, with a statistically significant difference ($p<0.05$).

To analyze factors influencing the Spruyt-Gozal and Epworth scores, a bivariate statistical study was conducted. In our study, asthma and obesity were found to be the two factors significantly affecting the increase in Spruyt-Gozal and Epworth scores among our rhinitic children (**Table 2**).

Table 2. Multivariate analysis study of factors influencing the Spruyt Gozal score and the Epworth sleepiness scale score.

		Spruyt Gozal Score			**Epworth Sleepiness Scale**		
		Score>2.72	Score<2.72	p value	>16	<16	p value
Mean age		7	9	>0.05	7	8	>0.05
Gender	male	25	17	>0.05	20	>0.05	
	female	35	23		30		
asthma		38	12	**<0.05**	32	18	**<0.05**
obesity		20	0	**<0.05**	20	0	**<0.05**
Sleeping Position: Supine Position		58	42	>0.05	48	52	>0.05
tabaco		20	13	>0.05	18	15	>0.05

Post-treatment sleep quality assessment showed a significant improvement in both sleep quality scores in 50 children. Fifty children with respiratory disturbances had a cumulative score <2.72 and a reduced Epworth score after well-managed treatment and good therapeutic adherence ($p < 0.05$) (**Table 3**).

Table 3. Distribution of children according to their cumulative Spruyt Gozal and Epworth Scores after two months of treatment.

		Percentage of patients (%)
Epworth Sleepiness Scale	0-9	50
	10-15	8
	>16	2
Spruyt Gozal Score	< 2.72	50
	> 2.72	10

For the 10 children who did not show improvement after treatment, further questioning revealed several issues. Three cases involved poor adherence to medical treatment. In five cases, there was associated asthma that was either uncontrolled or partially controlled. Additionally, two cases involved obesity or being overweight.

References

1. Lin SY, Melvin TAN, Boss EF, Ishman SL. The association between allergic rhinitis and sleep-disordered breathing in children: a systematic review. Int Forum Allergy Rhinol. 2013, 3(6), 504-509.
2. Liu J, Zhang X, Zhao Y, Wang Y. The association between allergic rhinitis and sleep: A systematic review and meta-analysis of observational studies. PloS One. 2020, 15(2):e0228533.
3. Li Z, Celestin J, Lockey RF. Pediatric Sleep Apnea Syndrome: An Update. J Allergy Clin Immunol Pract. 2016, 4(5), 852-861.
4. Bosnic-Anticevich S, Smith P, Abramson M, et al. Impact of allergic rhinitis on the day-to-day lives of children: insights from an Australian cross-sectional study. BMJ Open. 2020, 10(11):e038870.

5. Elsevier Masson. Rapport SFORL 2019 : rhinites allergiques, Elsevier Masson [Internet]. VG Librairies. [cited on 25 June 2023].
6. Bousquet J, Schünemann HJ, Togias A, et al. Next-generation Allergic Rhinitis and Its Impact on Asthma (ARIA) guidelines for allergic rhinitis based on Grading of Recommendations Assessment, Development and Evaluation (GRADE) and real-world evidence. J Allergy Clin Immunol. 2020, 145(1), 70-80.e3.
7. Masoud AI, Mosli RH. Arabic translation and validation of a pediatric sleep questionnaire to assess the prevalence of sleep-disordered breathing among Saudi pre-school children. BMC Pediatr. 2023, 23(1), 50. Doi: 10.1186/s12887-022-03820-2.
8. Attal BA, Al-Ammar FK, Bezdan M. Validation of the Arabic Version of the Epworth Sleepiness Scale among the Yemeni Medical Students. Sleep Disord. 2020, 2020:6760505.